

Specifications
Plug-in Modules and Accessories Available

Installation
Initial Inspection
Power Requirements
Fan Operation
Back/Bench Installation

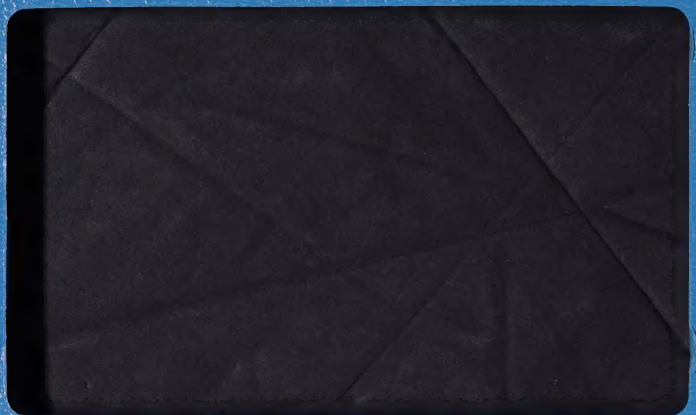
Operation
Introduction
Controls and Connectors

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TO OPEN
PUSH CENTER RING
UP $\frac{1}{2}$ "
& SWING TO LEFT.

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W A R R A N T Y

Weston-Lexington warrants each instrument manufactured by them to be free from defects in material and workmanship. Our liability under this Warranty is limited to servicing or adjusting any instrument returned to the factory for that purpose, and to replace any defective parts thereof. This Warranty is effective for one year after delivery to the original purchaser when the instrument is returned, transportation charges prepaid by the original purchaser, and when upon our examination it is disclosed to our satisfaction to be defective. If the fault has been caused by misuse or abnormal conditions of operation, repairs will be billed to the customer. In this case, an estimate will be submitted before the work is started.

IF ANY FAULT DEVELOPS, THE FOLLOWING STEPS SHOULD BE TAKEN:

1. Notify us giving full details of the difficulty; include the model number and serial number. On receipt of this information, we will give you service data or shipping instructions.
2. On receipt of shipping instructions, forward the instrument prepaid to the factory or to the authorized repair station indicated on the instructions. If requested, an estimate of the charges will be made before the work begins, provided the instrument is not covered by the Warranty.

SECTION I

DESCRIPTION AND SPECIFICATIONS

1.1. GENERAL DESCRIPTION

The Weston-Lexington Continuously Variable Oscillator Model 100 is a double-integrator, phase-shift oscillator covering a frequency range from 10Hz to 100kHz. The oscillator amplitude of 12V rms is held constant to $\pm 0.01\%$ up to 50kHz and waveform purity of 50ppm is typical over the operating frequency range. The CVO is also a two-phase oscillator with phase A defined as the reference phase and with phase B lagging phase A by $90^\circ \pm 0.1^\circ$ at mid-band. All circuits are fully isolated from the outer case and can be made fully floating with respect to powerline ground by means of a switch provided on the rear panel.

A precision film potentiometer is used for continuous frequency selection providing low noise, high reliability, and a linear scale dial. This continuous frequency variability is combined with an automatic range change feature which automatically switches the range switch to the next higher or lower scale when the frequency dial is rotated above or below the range limit. Thus, unidirectional dial rotation permits scanning the entire 10Hz to 100kHz frequency range without use of the range switch. (A range switch is provided for manual override.)

Fixed amplitude front-panel outputs are provided for each phase at a low output impedance and are capable of driving a wide variety of external inductive dividers without additional amplification or impedance buffering. Plug-in modules provide versatility and permit adding additional capability to handle new

requirements at a later date. A number of plug-ins are listed in Section 1.3. The Weston-Lexington Model 108 Auxiliary Plug-in, or any so listed in Section 1.3., are required to provide internal connections for basic unit operation.

1.2. SPECIFICATIONS

Range	10Hz-100kHz continuously variable in 4 decade ranges.
Controls	(a) Frequency dial with continuous control over a ten to one range; the dial is mechanically linked to the range multiplier switch for automatic range switching, with uni-directional rotation. (b) Four decade range multiplier switch, operable either automatically as described above or manually. (c) Multi-turn electrical vernier provides $\pm 2\%$ frequency deviation.
Main Dial Calibration Accuracy	$\pm 1\%$ of maximum dial setting, 10Hz-10kHz $\pm 2\%$ of maximum dial setting, 10kHz-100kHz
Resolution	Electrical vernier permits frequency output to be set to within $\pm 0.01\%$ when using an external counter or Weston-Lexington DRO Model 124 digital readout system.
Frequency Stability Vs. Time	$\pm 0.01\%/hr.$ 100Hz-100kHz maximum, at constant temperature and line voltage. $\pm 0.02\%/hr.$ 10Hz-100Hz maximum, at constant temperature and line voltage.
Frequency Stability Vs. Temperature	$\pm 0.01\%/^{\circ}C$ maximum, 100Hz-100kHz $\pm 0.02\%/^{\circ}C$ maximum, 10Hz-100Hz
Frequency Stability Vs. Line	$\pm 0.005\%$ maximum for 10% line variation
Frequency Stability Vs. Load	$\pm .01\%$ below 10kHz {no load to $\pm .025\%$ 10kHz-100kHz {full load
Voltage $\emptyset A$ & $\emptyset B$	12.11 volts rms nominal supplied at low impedance to: (a) Plug-in module

- (b) Front-panel fixed outputs
- (c) Rear-panel fixed outputs

Note: The nominal voltage may be varied by using some types of plug-ins. Refer to plug-in specifications for further information.

Resistive Load

60ma rms per phase maximum for specified performance. Current available from fixed output is reduced by plug-in requirements. Refer to plug-in specifications for further information.

Maximum Capacitance Loading for Specified Performance either Phase

500pf (10Hz-10kHz)	{ Parallel R_L
1000pf (10kHz-100kHz)	
300pf (10Hz-10kHz)	{ Parallel R_L
600pf (10kHz-100kHz)	
	{ greater than
	{ 1K Ω

Ratio Transformer Loading

Both $\emptyset A$ and $\emptyset B$ outputs capable of driving most commercial ratio transformers.

Voltage Accuracy at 400Hz and 25°C

$\emptyset A$: $\pm 0.05\%$
 $\emptyset B$: $\pm 1\%$
 $\pm 0.005\%$ (.0005db) 50Hz-10kHz (option 08)

FREQUENCY RESPONSE (referred to 400Hz)

$\emptyset A$: $\pm 0.01\%$ (.001db) 20Hz-50kHz
 $\pm 0.02\%$ (.002db) 10Hz-20Hz and 50kHz-100kHz

$\emptyset B$: $\pm 1\%$ (0.1db) 10Hz-20kHz
 $\pm 5\%$ (0.5db) to 100kHz

Harmonic Distortion

$\emptyset A$: 0.005% Max. 50Hz-60Hz and 380Hz-1kHz on X100 range
0.01% Max. 20Hz-50kHz
0.02% Max. 10Hz-20Hz 50kHz-100kHz

$\emptyset B$: Twice the values for $\emptyset A$.

Amplitude Stability
Vs. Time at Constant
Temperature & Line

ØA: 8 hours: $\pm 0.01\%$ Max.
One month: $\pm 0.05\%$ Max.
5-10 minutes: $\pm 0.002\%$ typical
(option 01 only)

ØB: Stability figures typically
twice those for ØA.

Amplitude Stability
Vs. Temperature

ØA: $\pm 0.01\%/^{\circ}\text{C}$, with $\pm 0.005\%/^{\circ}\text{C}$
available as option
(See internal options)

ØB: $\pm 0.025\%/^{\circ}\text{C}$

Amplitude Stability
Vs. Line

ØA: $\pm 0.005\%$ Max. for 10% line
variation.

Cycle-to-Cycle
Stability ØA and ØB

Less than $\pm 0.01\%$ including short-
term noise.

Tuning Transients

Maximum amplitude transients for
rapid, full-scale rotation of the
main tuning dial are typically less
than 2% (0.2db); normal, slow dial
rotation results in considerably
lower transient effects.

Output Impedance
12 volt front-
panel fixed outputs

ØA: 25 milliohms series .5 micro-
henries

ØB: 400 milliohms series 2 micro-
henries

12 volt rear-connec-
tor fixed outputs

ØA: 400 milliohms series 1 micro-
henry

ØB: 600 milliohms series 3 micro-
henries

Note: ØA rear connector impedance
easily modified to 25 milli-
ohms instead of front panel.
Instructions given in manual.

Amplitude will change $\pm 0.02\%$
above 50kHz for a 0 to full
load change on ØB.

ØB amplitude will change
0.4% at 10Hz, and 0.2% above
30Hz for 0 to full load
change on ØA.

Quadrature Phase
Accuracy

$\pm 0.1^\circ$ (400Hz-10kHz)
 $\pm 1^\circ$ (10kHz-100kHz)

$\pm .1^\circ \times \frac{400}{f(\text{Hz})}$ (10Hz-400Hz)

Line Frequency Beat

Less than $\pm 0.01\%$ near line frequency,
or multiples.

DC Component

Capacitor coupled output

Overload Protection

All outputs may be continuously
overloaded or short-circuited with-
out damage. The oscillator meets
all performance specifications after
the overload is removed, except full
specified amplitude and frequency
stability performance requires sev-
eral minutes for internal tempera-
ture restabilization.

Floating Operation

A rear panel switch is provided
which disconnects signal ground
from the chassis to allow floating
operation.

External Modulation

A rear panel switch is provided to
allow amplitude modulation by slow-
ly varying control signals.

Rear Panel Connector
Signals

- (a) 12.11V $\sqrt{\text{rms}}$ fixed, ØA & ØB outputs
- (b) Plug-in attenuator outputs (most
plug-ins)
- (c) External modulation input
- (d) Range switch position contact-
closure outputs
- (e) External synchronization input
(option 05)
- (f) DC voltage output proportional
to the operating frequency with-
in each 10:1 frequency range.
(Option 06)

Temperature Range for Specified Performance	15° - 40°C
Operating Temperature Range	0° - 52°C
Warm-up Time	30 minutes maximum for stated stability
Shock and Vibration	Meets all performance specifications after being subjected to the applicable shock and vibration requirements of MIL-T-945.
Power Requirements	105-130 or 210-260 Volts single phase; 47-66Hz; 80 Watts
Dimensions and Weight	5-1/4" high, 16-7/8" wide, 15-3/4" deep; 30 lbs.

INTERNAL OPTIONS

- 01 $\pm 0.05\%/^{\circ}\text{C}$ maximum, $\emptyset\text{A}$ amplitude variation versus temperature.
- 05 External synchronization - 1 volt rms will lock oscillator over a $\pm 0.5\%$ frequency range.
- 06 Rear panel dc voltage output proportional to operating frequency within each 10:1 frequency range.
(a) Linearity: $\pm 1\%$ of max. dial setting.
(b) Output voltage range: 1.0 to 10.0 volts
(c) Output Impedance: 0.5 ohm max.
(d) Load resistance: 1000 ohms min.
- 07 Guard Driver and rear-panel connector which allows long leads to be used on attenuator $\emptyset\text{A}$ output without affecting frequency response. The Guard Driver is capable of driving up to 1000pf at 100kHz.
- 08 $\pm 0.005\%$ (0.0005db) frequency response from 50Hz to 10kHz.

1.3. PLUG-IN MODULES AND ACCESSORIES AVAILABLE*

PLUG-IN MODEL NO.	DESCRIPTION
108	Auxiliary Plug-in
109	Single phase divider with moderate accuracy and resolution.
110	Same as 109 only 2 phases.
111	High resolution and high mid-band accuracy.
112	db attenuator for extremely flat frequency response.
114	10 volt standardizer for setting 0 impedance reference output to exactly 10 volts for driving ratio transformers, etc.
117	Function generator with sine wave, pulse and square wave outputs.

*This is a list of those plug-ins which were available at the time this manual was printed and is therefore not necessarily complete.

SECTION 2

INSTALLATION

2.1. INITIAL INSPECTION

This instrument has been carefully inspected both mechanically and electrically before shipment and it should be in perfect operating condition and free from all scratches or mars. It should be inspected for physical damage caused in transit to confirm this fact.

2.2. POWER REQUIREMENTS

The Model 100 CVO may be operated from any source of 115 volts 50 to 60Hz. Power requirements are approximately 80VA. If 230 volts is to be used, refer to the block diagram in Section 6 for wiring changes. The unit is supplied with a three-conductor power cable such that the instrument case is normally grounded when the cable is plugged into the appropriate receptacle. The ground wire is the offset pin on the power cable.

2.3. FAN OPERATION

Although the Model 100 CVO is fully transistorized, it is forced air cooled for higher reliability and longer operating life. Because of this fact, care should be taken not to block the fan intake and restrict air circulation. The fan filter should be cleaned regularly to guarantee a long, trouble-free life. The instrument, however, should not be operated where the ambient temperature is in excess of 52°C (125.6°F).

2.4. RACK/BENCH INSTALLATION

The Model 100 CVO is shipped as a bench-mounted instrument. An accessory rack-mounting kit is available which includes the necessary instructions for installation.

SECTION 3

OPERATION

3.1. INTRODUCTION

All instructions and information necessary for the operation of the Model 100 CVO is contained in this section.

3.2. CONTROLS AND CONNECTORS

The front and rear panel controls and connectors are identified and illustrated in Figures 3-1 and 3-2.

3.3. TURN-ON PROCEDURE

To turn on the Model 100 CVO, proceed as follows:

- a. Apply ac power to the Model 100 CVO by plugging in the three conductor power cord supplied with the unit from the power input connector to a proper power receptacle.
- b. Push power button: The button should illuminate when the unit is on.

3.4. OPERATING INSTRUCTIONS

For normal operation, proceed as follows:

- a. Set floating grounded switch on rear panel to grounded position.
- b. Set external modulation switch on rear panel to off position.

3.4.1. FREQUENCY SELECTION

To select a desired frequency, set the multiplier switch to the desired range, set the frequency dial to the appropriate

position and set the frequency vernier to its zero position. Use mechanical vernier for fine frequency adjustments and frequency vernier for very fine frequency adjustments.

3.4.2. RANGE CHANGE

- a. Manual: The frequency range may be changed by manually operating the multiplier switch.
- b. Autorange: The frequency range may also be changed by turning the frequency dial through the section marked "AUTORANGE". Passing through this section in the clockwise direction changes the range to the next lower position, and counterclockwise rotation changes the range to the next higher position.

3.4.3. AMPLITUDE CONTROLS

The signals are brought to the front-panel reference outputs at very low impedance and at a level of 12.11 volts rms. The signal voltage is also supplied to the plug-in module connector at low impedance. (See manual on plug-in module used for further information and instructions.)

3.4.4. FLOATING OPERATION

If it is desirable to connect the outer case of the Model 100 CVO to a point other than oscillator output low, set floating/grounded switch in the "FLOATING" position. (It is not recommended to drive the chassis at any frequency above 10Hz because of excessive beat.) The voltage between chassis and circuit ground should not exceed 100 volts peak or dc.

3.4.5. EXTERNAL MODULATION

Set external modulation switch on rear panel to "EXT. MOD" position. The amplitude should drop to 1/2 its value when switch

is in this position. The modulating signal is connected between pins 4 (hi) and 8 (gnd) on the rear connector. The impedance between pins 4 and 8 is 10K ohms. Set the oscillator to the desired carrier frequency (see section 3.4.1.), and adjust the magnitude of the modulating signal for the required modulation. When high percentage modulation is required, it is recommended that the highest modulating frequency be limited to 1/5,000 to 1/10,000 of the carrier (oscillating) frequency. Maximum modulating signal for 100% modulation will never exceed 5 volts peak-to-peak.

3.4.6. EXTERNAL SYNCHRONIZATION MODE (Option 05)

Set external synchronization switch to "EXT. SYNC." position. Check fuse which is 1/32 amp type. Connect synchronizing signal between pins 10 (hi) and 8 (gnd) on rear connector. One volt rms into the 7.6K ohms input impedance is necessary for synchronization. Adjust the CVO frequency (section 3.4.1.) to the synchronizing frequency and observe the Lissajous pattern between the two frequencies as shown in Figure 3-1 below:

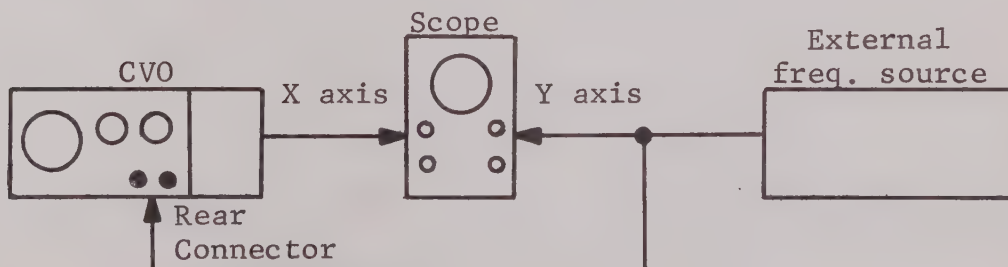
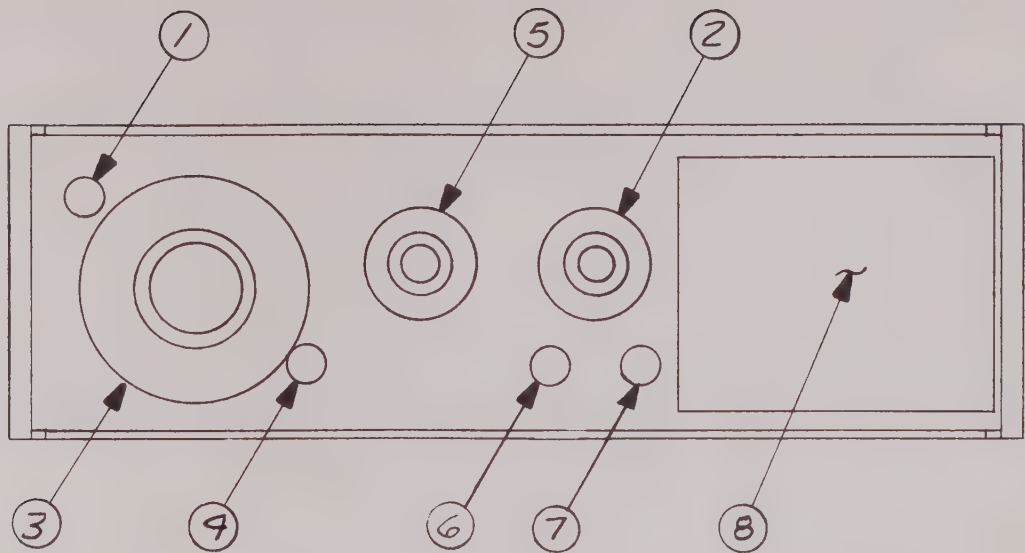


Figure 3-1

Test Circuit for External Synchronization

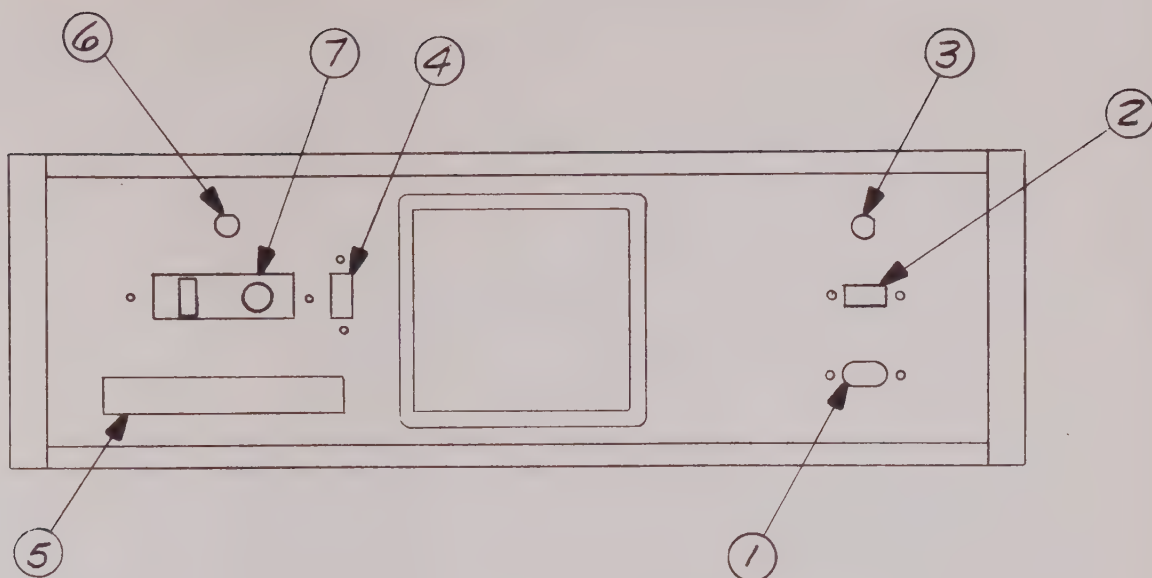
The oscillator is in synchronization when the Lissajous pattern stops rotating. The oscillator will remain in synchronization for a $\pm 0.5\%$ variation in synchronizing frequency.



1. POWER push button (internally lighted), applied operating power to the unit.
2. MULTIPLIER switch, selects output frequency range.
3. FREQUENCY DIAL adjusts frequency within range setting of multiplier.
4. MECHANICAL VERNIER very fine adjustment of frequency dial.
5. FREQUENCY VERNIER electrical adjustment of output frequency for extremely fine control.
6. PHASE A OUTPUT (J4) main output of unit.
7. PHASE B OUTPUT (J5) lags phase A output by 90°.
8. PLUG-IN CAVITY accepts plug-in modules to extend the operation of the basic CVO.

Figure 3-2

Front Panel Controls and Connectors



1. POWER INPUT connector (J2) accepts the power cord supplied with the instrument.
2. FLOATING/GROUNDED switch (S1) disconnects internal ground from chassis for floating operation.
3. MAIN UNIT FUSE protects internal circuits.
4. EXTERNAL MODULATION switch (S2) allows amplitude to be modulated by external signal.
5. MAIN REAR CONNECTOR (J1) provides plug-in outputs, $\emptyset A$, $\emptyset B$, zero output impedance, range switch position information.
6. PLUG-IN OUTPUT WITH DRIVEN GUARD (option 07) allows long leads to be used on attenuator $\emptyset A$ output without affecting frequency response.
7. EXTERNAL SYNCHRONIZATION SWITCH PLATE (option 05) provides external synchronization on main rear connector.

Figure 3-3

Rear Panel Controls and Connectors

SECTION 4

THEORY OF OPERATION

Figure 4-1 shows the dual-integrator oscillator configuration with the addition of the automatic phase-adjusting, amplitude-control feedback loop. Operational amplifiers A1 and A2, in conjunction with R2-C1 and R4-C2 respectively, constitute the integrators; with $R2 = R4$ and $C1 = C2$. Ganged precision, infinite-resolution potentiometers R1 and R3 provide continuous frequency variation that is linear with potentiometer ratio and consequently dial setting on each range. Capacitors C1 and C2 are switched in decade steps to furnish decade frequency ranging.

Each integrator furnishes approximately 90° of phase-shift. Operational amplifier A3 supplies the additional 180° to close the oscillating loop. Due to the fact that both A1 and A2 are finite, however, the total loop phase-shift is slightly less than 360° . The additional network from the output of A1 to the summing junction of A3 composed of R7 and R8 in series with the modulator M, supplies a phase-advance, make-up signal.

The current through R7 and R8 is in quadrature with the current through input resistor R5 into inverting amplifier A3, so that for reasonable gains -- say 10,000 -- in A1 and A2, only a small signal is required at E₄ to swing the total feedback vector the incremental phase-shift required.

E₄ is determined by rectifying the output E₂ from amplifier A2, and comparing the result with the potential of a precision zener reference via an integrator I as shown. Use of the integrator supplies a typical gain of over 50,000 for the amplitude-

controlling loop. Integrator output E_5 controls the modulator M, which in turn sets the magnitude of E_4 , the incremental phase signal.

Precision infinite-resolution potentiometers R1 and R3 control the frequency at which the loop will oscillate by determining, in conjunction with R2-C1 and R4-C2, the frequency at which net loop gain is unity. R5 is set equal to R6, so that inverter output E_3 equals inverter input E_2 . Loading of potentiometers R1 and R3 by integrator input resistors R2 and R4 respectively, is small enough to be neglectable in a first-order analysis. (In the actual instrument, the dial calibration takes into account the small loading effect.) Hence net loop gain is unity at the frequency f_0 at which the absolute value of the (identical) integrator gains $(\frac{1}{2\pi f_0 R_2 C_1} \text{ and } \frac{1}{2\pi f_0 R_4 C_2})$ are equal to the (identical) attenuations of ganged potentiometers R1 and R3. Thus $E_1 = E_3$ as well since the attenuation through R1 is exactly compensated by the gain through the integrator (R2-A1-C1). E_2 is taken via a precision divider as the main oscillator output E_{01} . E_1 is used -- via another divider -- as a quadrature output E_{02} for applications in which such an output is desirable -- gyro supplies, calibration of phase-sensitive voltmeters and similar measurements areas.

Use of the precision infinite-resolution potentiometers for frequency control provides low-noise performance, with reliability that wirewounds would be unlikely to afford (the potentiometers employed are rated for in excess of 5 million revolutions). Use of potentiometers -- as opposed to rheostats or variable capacitors -- also makes possible a linear frequency dial scale, plus low, virtually constant circuit impedances even at the lower frequencies.

Integrator amplifiers A1 and A2 are stabilized at 6db/octave up to 150 kHz. The slope changes to 12 db/octave from about 150 kHz to within two octaves of crossover which occurs at about 5 MHz, changing to 6 db/octave near crossover. The 12 db/octave stabilization in the instrumentation oscillator application furnishes high loop gain and full drive to higher frequencies, plus lower, wide-band noise and greater freedom from rate-limiting problems, than would be possible with the same closed-loop bandwidth using more conventional 6 db/octave stabilization.

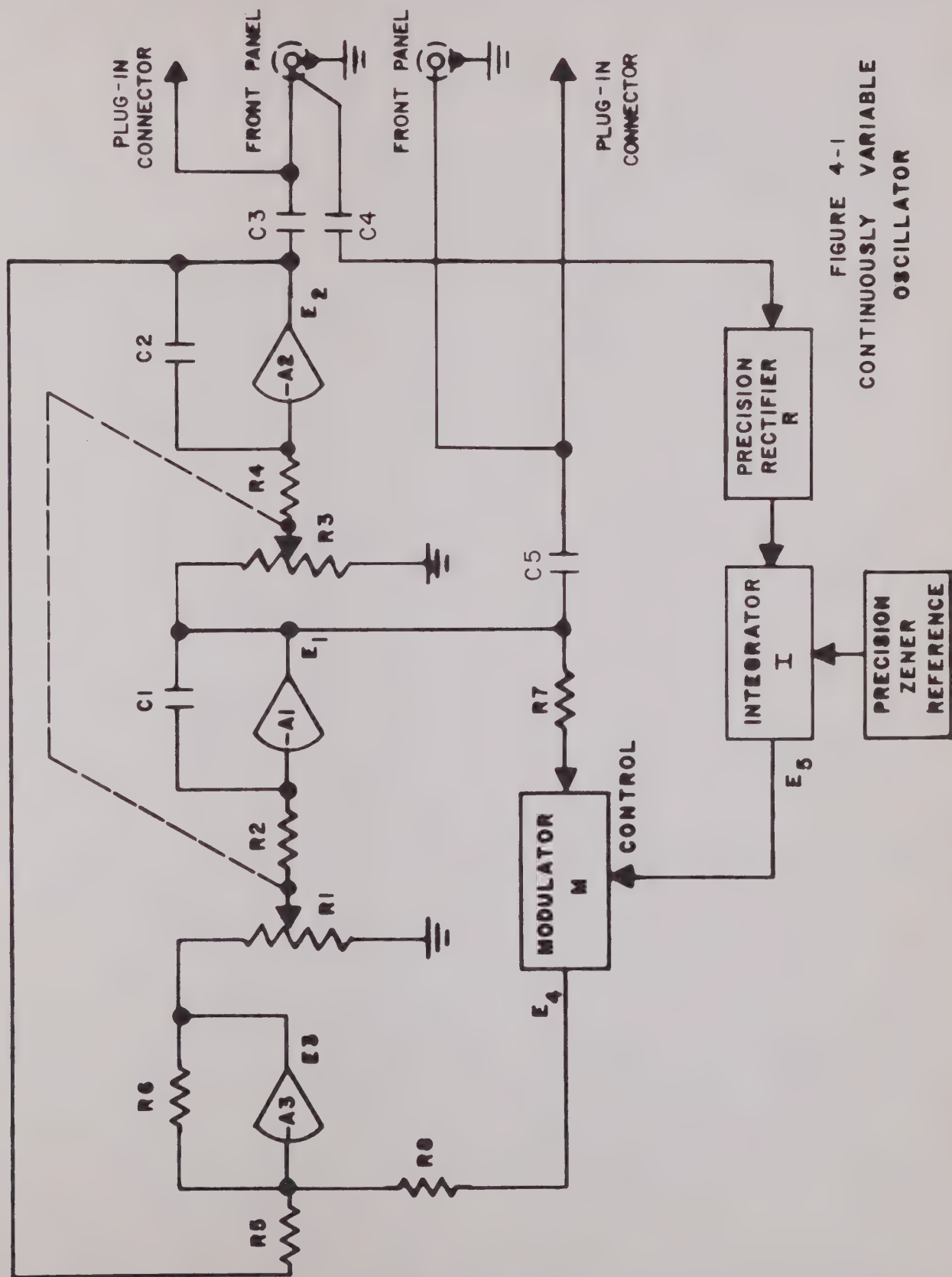


FIGURE 4-1
CONTINUOUSLY VARIABLE
OSCILLATOR

SECTION 5

CALIBRATION

This section includes a complete calibration procedure for the Model 100 CVO oscillator. Adjustments need not be made in the sequence listed.

5.1. AUTOSHIFT MECHANISM ADJUSTMENT

- a. Remove the autoshift connecting bar by removing the small E washer holding it to the sprocket and disc assembly. Tighten up on all parts of the connecting bar so as to minimize its length. Remount the connecting bar on the sprocket and disc assembly with the E washer.
- b. Set main dial $1/8$ inch from panel and tighten the set screw near "6" on the dial such that it bottoms on the flat of the main dial shaft. Wiggle the main dial when setting the screw against the flat.
- c. With the range switch set for any range, adjust the connecting bar until a tooth on top of the sprocket is straight up and down. Overadjust the connecting bar until a click occurs at the bottom of the sprocket as the main dial is swung clockwise: This indicates an interference with the next sprocket tooth. Underadjust the connecting bar until a click occurs at the bottom of the sprocket. Set the adjustment on the connecting bar $1/2$ way between the over and under positions and tighten it securely.
- d. Go through the ranges and check that the disc pin does not hit a sprocket tooth before engaging the bottom tooth.

Adjust the length of the connecting bar as necessary in order to accomplish this requirement. In the clockwise direction, the autoshift should engage when the F on the dial is at the frequency marker. In the counterclockwise direction, the autoshift should engage when the U on the dial is at the frequency marker.

- e. Set the main dial at 1 and rotate the range switch up and down the ranges. Set the main dial at 10 and repeat the rotation of the range switch. When rotating the range switch, the main dial must not move. If the dial moves, adjust the connecting bar as necessary and then repeat steps 5.1-d and 5.1-e.

5.2. FREQUENCY ADJUSTMENT

- a. Adjust the main dial pot position such that the pot discontinuity occurs in the middle of the autoshift. This can be best accomplished by loosening the set screws holding the pot shaft and rotating the pot shaft until the discontinuity occurs: At this point set the main dial at 1. Tighten the set screws holding the pot shaft. Next use an open-end wrench to adjust the barrel of the pot until the discontinuity occurs at the middle of the autoshift.
- b. Adjust the $\pm 2\%$ vernier pot such that at the 50% point of its rotation capability the vernier dial reads 0.
- c. With a Weston PR840 RMS to DC converter or equivalent and an electronic counter, record $\emptyset A$ output when the main dial is set at 10 and the range switch is set at 100. Make sure that the $\pm 2\%$ vernier dial is at 0. Adjust the high frequency trims (R2 and R11 on the backboard) until the following simultaneously occur:

Counter on $\emptyset A$ reads 1000 ± 1 Hz

$\emptyset B$ output magnitude is the same as $\emptyset A \pm 0.05\%$

It will be found that the clockwise rotation of either R11 or R2 will cause the frequency to increase. However, it will also be found that the clockwise rotation of R11 causes $\emptyset B$ magnitude to decrease while the clockwise rotation of R2 causes $\emptyset B$ magnitude to increase. For this reason it will normally be necessary to adjust both R2 and R11 simultaneously for frequency after setting the magnitude.

- d. Again with the RMS to DC converter or equivalent and a counter, record $\emptyset A$ output when the main dial is set at 1 and the range switch is set at 100. Adjust the low frequency trims (R3 and R7 on the backboard) until the following simultaneously occur:

Counter on $\emptyset A$ reads 100 ± 1 Hz

$\emptyset B$ output magnitude is the same as $\emptyset A \pm 0.1\%$

It will be found that the clockwise rotation of either R3 or R7 will cause the frequency to increase. However, it will also be found that the clockwise rotation of R7 causes $\emptyset B$ magnitude to decrease while the clockwise rotation of R3 causes $\emptyset B$ magnitude to increase.

- e. Repeat steps 5.2.3. and 5.2.4. until both are simultaneously within their specified limits.
- f. With the range switch set at 100 sweep the main dial from 1 to 10 and note the magnitude of $\emptyset B$. It should remain constant within $\pm 1\%$ of the magnitude of $\emptyset A$.
- g. With the electronic counter, note the frequency when the main dial is set at 5 and the range switch is at 100. The frequency should be 500 ± 5 Hz.
- h. With the counter, record $\emptyset A$ output when the main dial is set at 10 and the range switch is set to 10 and then to 1K. The counter should read 100 ± 0.2 Hz and $10,000 \pm 20$ Hz respectively.

- i. With the RMS to DC converter and the counter, record $\emptyset A$ output when the main dial is set at 1 and the range switch is set at 10K. Adjust trim capacitors C15 on SW1-C board and SW1-D board until the following simultaneously occur:

Counter on $\emptyset A$ reads $10,000 \pm 100$ Hz

$\emptyset B$ output magnitude is the same as $\emptyset A \pm 0.5\%$

It will be found that the clockwise rotation of C15 on either SW1-C or SW1-D will cause the frequency to decrease. However, it will also be found that the clockwise rotation of C15 on SW1-D causes $\emptyset B$ magnitude to decrease while the clockwise rotation of C15 on SW1-C causes $\emptyset B$ magnitude to increase.

- j. Note the peak-to-peak magnitude of the signal on the test jack of the A4 board with an oscilloscope as the main dial is swept from 1 to 10 with the range switch set at 10K. Adjust the trim resistor R10 on SW1-C until the peak-to-peak magnitude never is greater than 500mV and never is less than 20mV.

- k. With the RMS to DC converter and the counter, record $\emptyset A$ output when the main dial is set at 10 and the range switch is set at 10K. Adjust trim capacitors C15 and C15 on SW1-C board and SW1-D board until the following occur simultaneously:

Counter on $\emptyset A$ reads $100,000 \pm 1,000$ Hz

$\emptyset B$ output magnitude is the same as $\emptyset A \pm 0.5\%$

1. Repeat steps 5.2-i, 5.2-j, and 5.2-k until all are simultaneously within their specified limits.

5.3. AMPLITUDE ADJUSTMENT

With a thermal-transfer device (Weston 1573 or equivalent) on $\emptyset A$ set the main dial at 10 and the range switch at 100. Adjust the trim resistor R9 on the A4 board until the voltage magnitude is 12.110 volts $\pm 0.01\%$.

5.4. FREQUENCY RESPONSE ADJUSTMENT

Capacitor C12 on the A4 board has been provided to adjust the high-frequency response of the oscillator. It is not anticipated that this capacitor should normally require readjustment during the life of the equipment. Readjustment is not recommended unless the high-frequency response is outside of specification limits. The only type of commercially-available equipment which is sufficiently accurate for these measurements to 100 kHz is the Hermach high-frequency, thermal-transfer standard (Englehard Industries - Part No. 34970-10C) or equivalent.

5.5. SETTLING TIME ADJUSTMENT

- a. In order to maintain a reasonably constant low-level dc offset out of the A2 integrator as the frequency dial is rotated, a trim potentiometer R50 has been included on the A1 board. This maintains a constant dc into the main output coupling capacitors which reduces tuning transients and minimizes settling times.
- b. Turn the CVO off and remove the A4 board. Attach a DC oscilloscope to the test jack on the A3 board (Pin E of the A3 board). Set main dial at 10 and range switch at 10K. Turn the CVO on and note the DC level as read on the oscilloscope. Using the 10 position of the dial as a reference, slowly rotate the dial to the 1 position. Adjust the trim potentiometer R50 on the A1 board until the maximum change of the DC does not exceed 10mV during the 10 to 1 sweep of the main dial.
- c. Turn the CVO off and replace the A4 board. Turn the CVO on and check to insure that signals exist at the ØA and ØB connectors.

SECTION 6

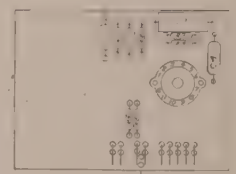
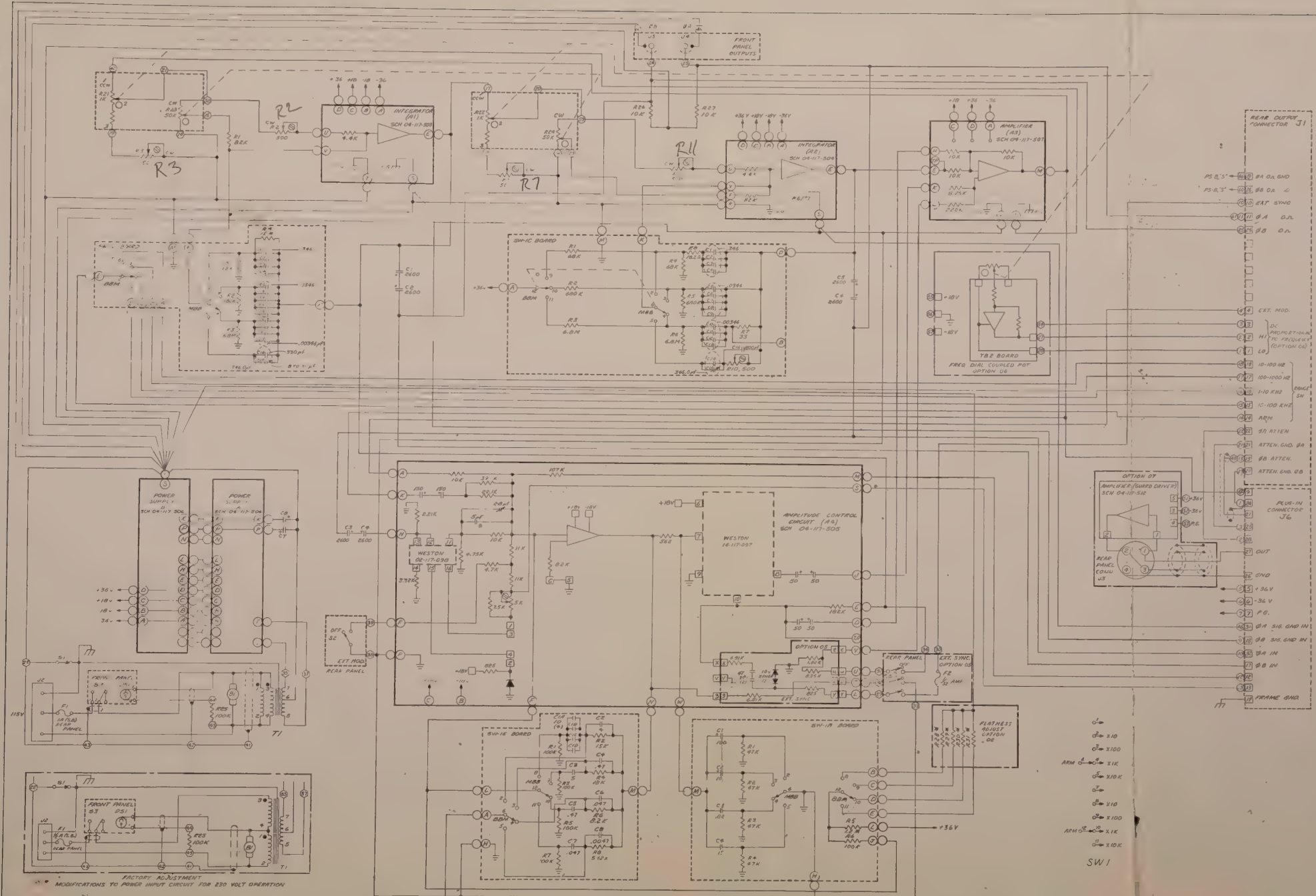
CIRCUIT AND LOCATION DIAGRAMS

This section contains an overall block diagram and assembly location diagram, as well as detailed circuit and location diagrams necessary for maintenance of the Model 100 CVO.

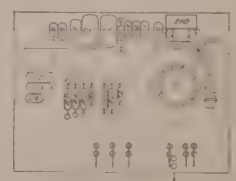
The block diagram when used in conjunction with the Theory of Operation (Section 4), should aid in understanding circuit interrelationships.

Following is a list of the diagrams included in this section.

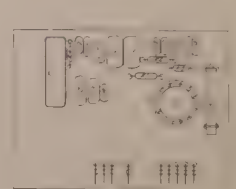
<u>Number</u>	<u>Title</u>
04-117-508	Block Diagram
04-117-164	Overall Location Diagram
04-117-503	Integrator A1
04-117-504	Integrator A2
04-117-505-1	Schematic, Amplitude Control Ckt A4
04-117-505-2	Location, Amplitude Control Ckt A4
04-117-506	Power Supply "A" and "B"
04-117-507	Amplifier A3



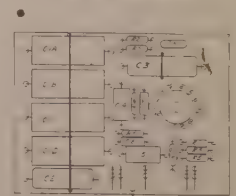
LOCATION, SW-IC BOARD
(NOTE: R5 C/P NOT LOCATED ON 100 SERIES - SHOWN ONLY IN 100A SERIES)



LOCATION, SW-AC BOARD



LOCATION, SW-IE BOARD



LOCATION, SW-IE BOARD

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
A. RESISTOR VALUES ARE IN OHMS.
B. CAPACITOR VALUES ARE IN MF.
C. 2 SYMBOLS INDICATE LOCATION.
D. 1 SYMBOL INDICATES INTERNAL BOARD.
E. INDICATES MAIN BOARD AND 1/2 SYMBOL INDICATES SUB-BOARD.
F. INDICATES CONNECTOR AND AT 1/2 & 1/2.
G. INDICATES TEST.

ITEM	DESCRIPTION	QUANTITY	REMARKS
1	WESTON 16-117-057	1	
2	WESTON 06-117-050	1	
3	WESTON 06-117-050	1	
4	WESTON 06-117-050	1	
5	WESTON 06-117-050	1	
6	WESTON 06-117-050	1	
7	WESTON 06-117-050	1	
8	WESTON 06-117-050	1	
9	WESTON 06-117-050	1	
10	WESTON 06-117-050	1	

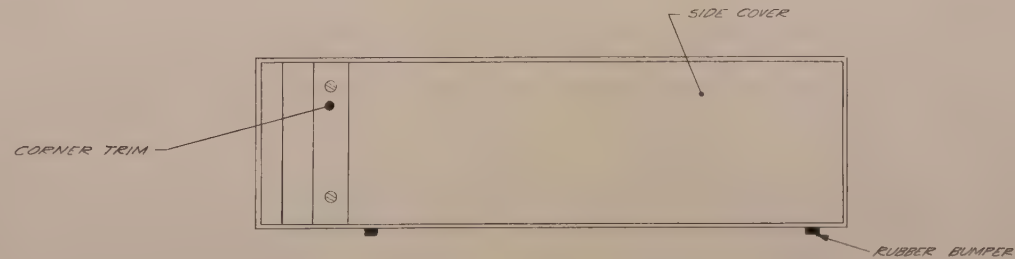
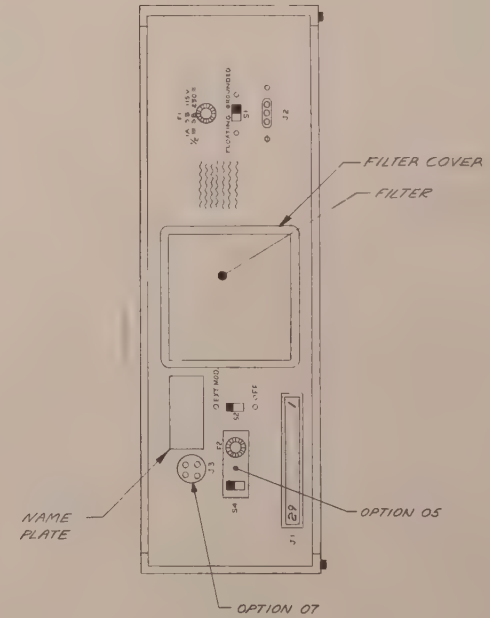
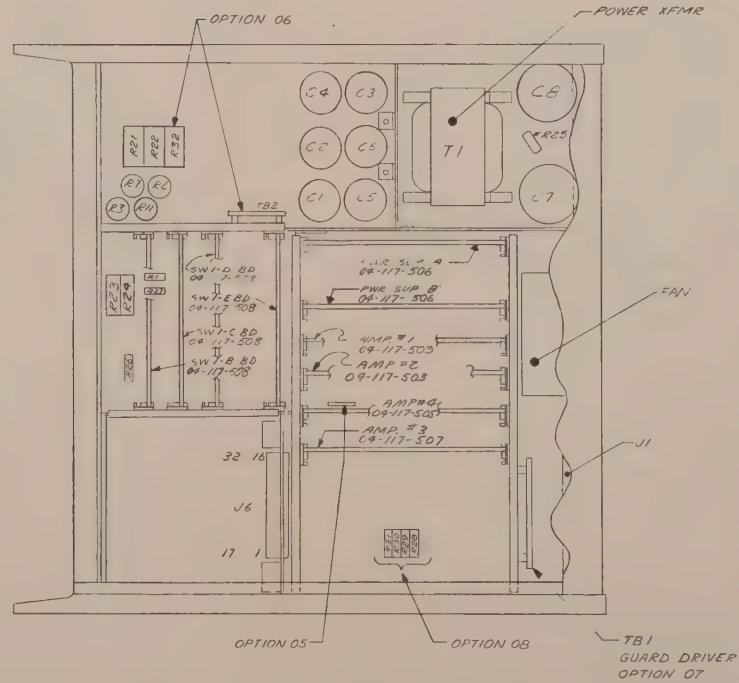
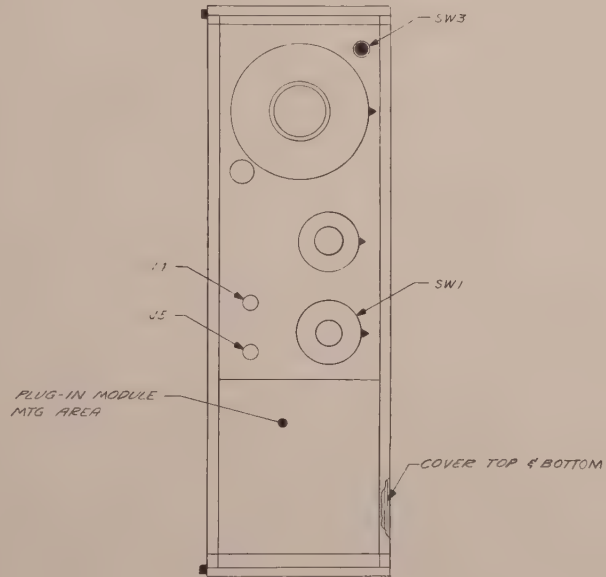
SW 1

FACTORY ADJUSTMENT
MODIFICATIONS TO POWER INPUT CIRCUIT FOR 230 VOLT OPERATION

FRONT VIEW

TOP VIEW

REAR VIEW



RIGHT SIDE VIEW

08	FLATNESS	R's 28, 29, 30, 31
07	GUARD DRIVER	TB1, J3
06	REAR PANEL DC PROPORTIONAL TO DIAL	TB2, R32
05	EXTERNAL SYNC	S4, F2, A4 EXT SYNC
NO.	TYPE	COMPONENT PARTS
OPTIONS		

 WESTON-ROTEK		WESTON INSTRUMENTS, INC.	
Head On	Scale 1:2	Date 3-3-67	Log 1114-5-847
	Dr ART KINTER	Dwg	718167
	Check R. Robinson	Project 100	
LOCATION, CVO			
Size	Drawing No	Sheet	Per
D	11-1117-164	LONG	1

NOTES:

1. UNLESS OTHERWISE SPECIFIED:

a- RESISTOR VALUES ARE IN OHMS.

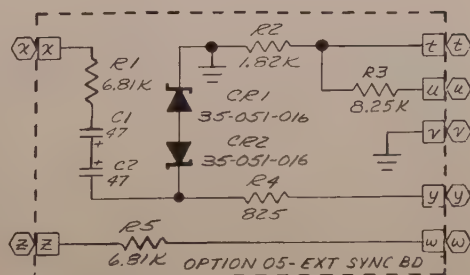
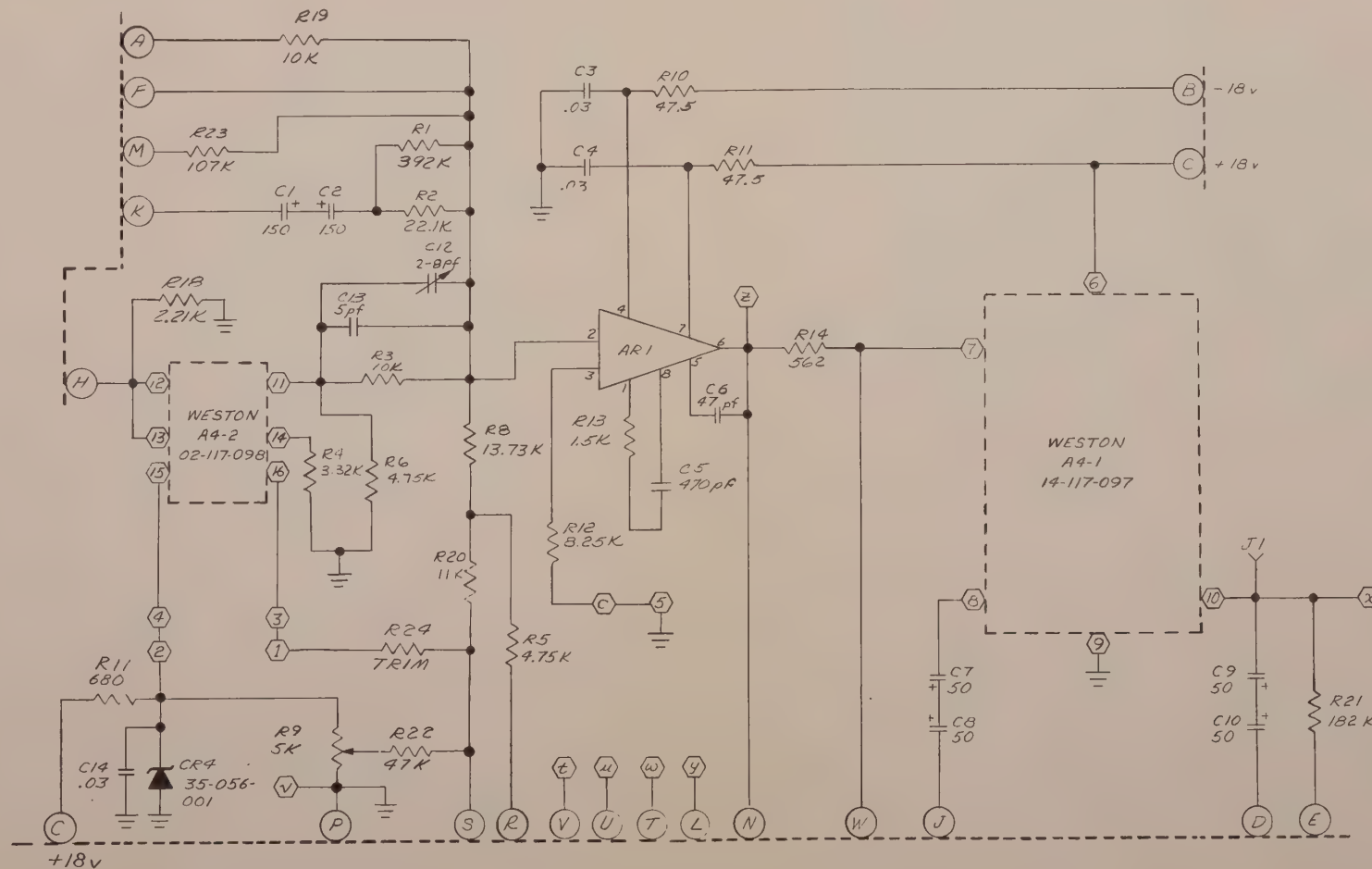
b- CAPACITOR VALUES ARE IN μ F.

NORMAL OPERATION:

JUMP: 1 $\rightarrow$ 3

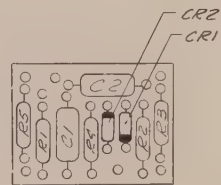
2 $\rightarrow$ 4

5 $\rightarrow$ C

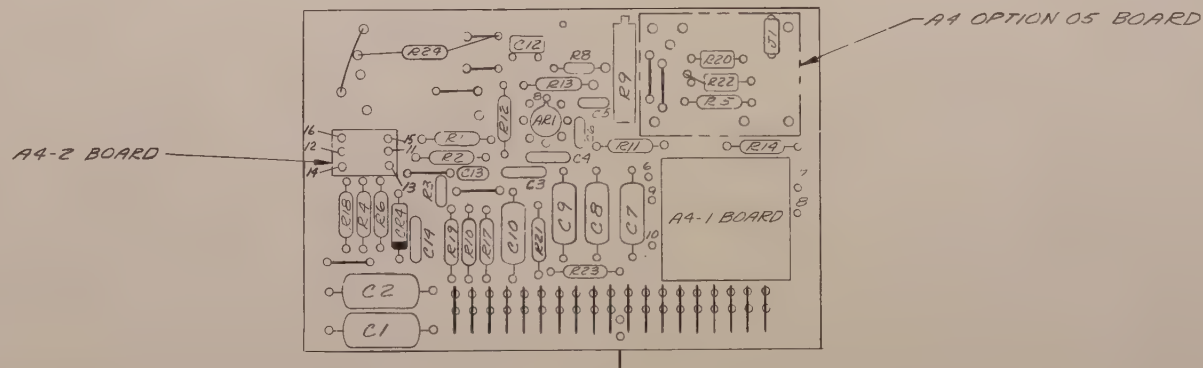


04-117-505

WESTON-ROTEK			
WESTON INSTRUMENTS, INC.			
Used On	Scale	Date	2/7/67
	Dr. K. PATTERSON	App.	7/16/67
	Checked R. ROGERS	Filed	CVO
SCHEMATIC, AMPLITUDE CONTROL CRT, A4			
Size	Drawing No.	Sheet	Per
C	04-117-505	1 of 2	A

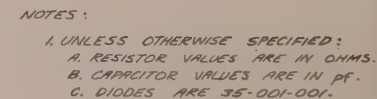
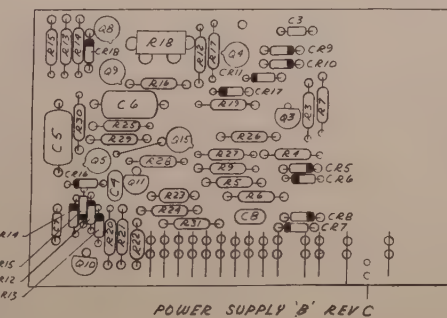


LOCATION
A4 OPTION 05 BOARD

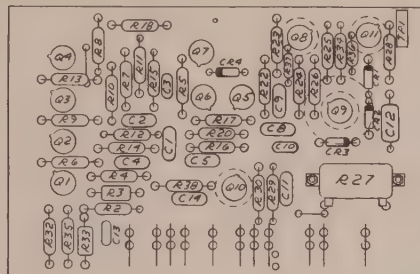


04-117 505

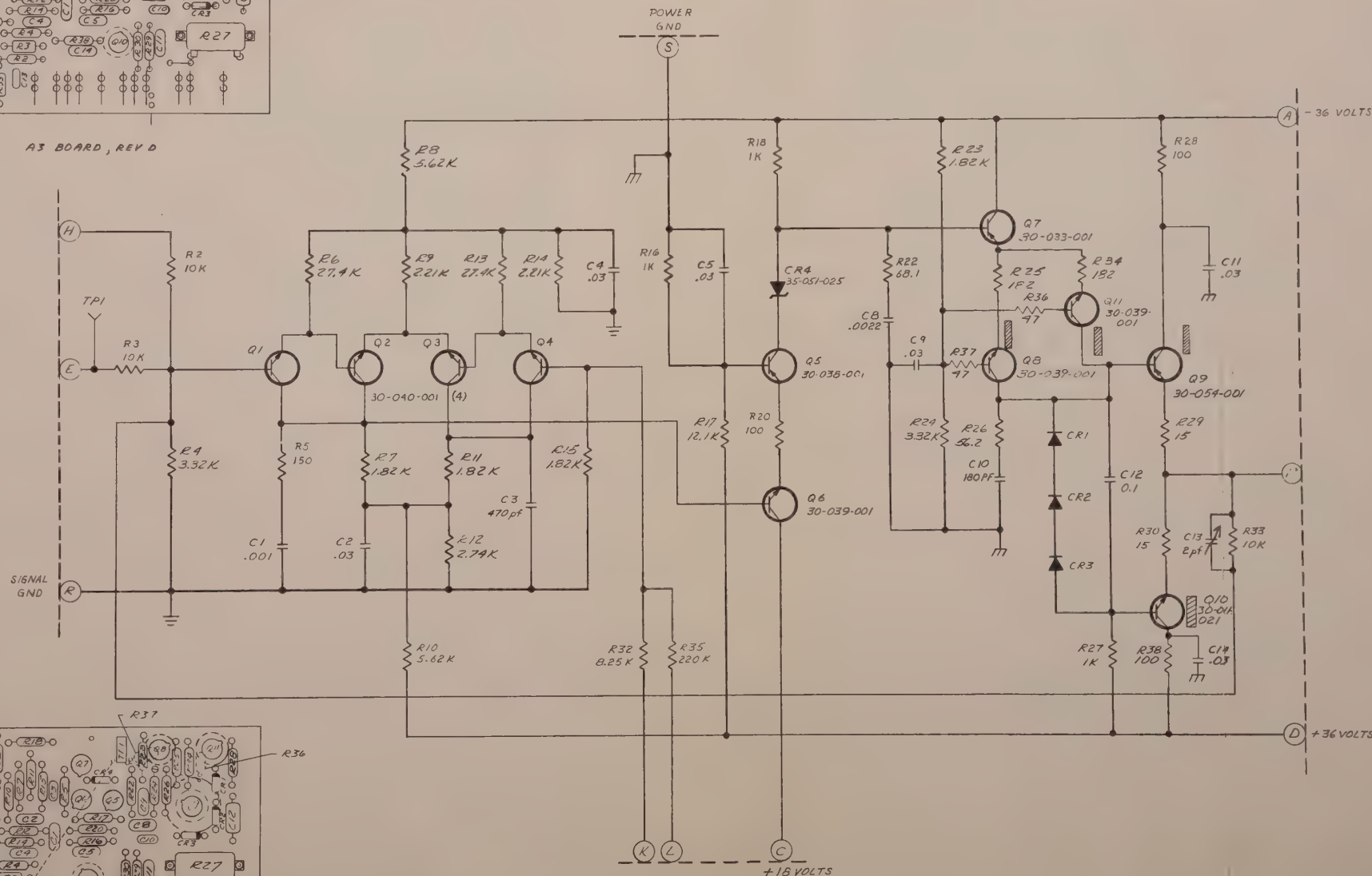
 WESTON-ROTEK		WESTON INSTRUMENTS INC.	
Used On	Serial-1 Date-7/16/67 Ins- <i>VTI</i> ② 7/16/67 By <i>RON SIERGENT</i> App- <i>jm</i> 7/16/67 Check- <i>F. ROGERS</i> Pric- <i>100</i> SCHEMATIC, AMPLITUDE CONTROL CKT. A2		
	Size	Drawing No	Sheet
	C	04-117-505	2 of 2 A



Lot	100	Revision	Dr	Date	12/1/77
		WESTON-ROTEK		WESTON INSTRUMENTS, INC.	
Draw No					
Scale	1/4" = 1"	Drawing No	WIT 2-1-77		
Dr	FEB	Rev	7/1/77		
Dr	WILLIAM ROGERS	Rev	100		
SCHEMATIC, RES POWER					
SUPPLY 115V					
Size	Drawing No	Sheet	Rev		
D	04-117-506	1 of 1	B		

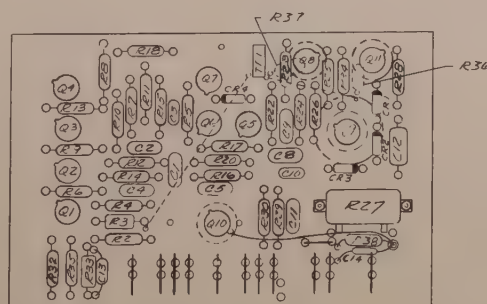


A3 BOARD, REV D



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
- A. RESISTOR VALUES ARE IN OHMS.
- B. CAPACITOR VALUES ARE IN μ F.
- C. DIODES ARE 35-001-001.



A3 BOARD, REV A

Scale: 100%		Date: 2/7/77	By: R.A.A.
Checked: F. ROGERS		Drawn: CVO	Rev: 1
SCH. 9 AMPLIFIER (A3)			
Item	Quantity	Part No.	Rev.
D	04-117-507	LM L	B

SECTION 7

REPLACEABLE PARTS

This section contains ordering information for replacement parts listed by assembly. If the value of a component is determined at final test (designated by *), only the manufacturer is given. Where manufacturer and type are not given (designated by **), parts may be ordered directly from Weston-Lexington. These parts should be identified by Weston-Lexington part number; the instrument model number and serial number should also be specified.

Following is a list of assemblies included in this section.

<u>Name</u>	<u>Schematic Number</u>	<u>Page</u>
Frame Assembly	07-117-288	7-2
Integrator Board A1	04-117-503	7-3
Integrator Board A2	04-117-504	7-5
A4 Board	04-117-505	7-7
Power Supply "A"	04-117-506	7-8
Power Supply "B"	04-117-506	7-9
Amplifier A3	04-117-507	7-10
SW1-B Board	04-117-508	7-12
SW1-C Board	04-117-508	7-13
SW1-D Board	04-117-508	7-14
SW1-E Board	04-117-508	7-15
Backboard	04-117-508	7-16
Accessory List	-	7-17
Options	-	7-18

REFERENCE DESIGNATION	DESCRIPTION	W-L PART NO	MANUFACTURER	MFR. TYPE
B1	REAR PANEL SUBASSEMBLY Fan, Muffin Venturi	26-006-001	Rotron	--
F1	Fuse, 1ASB 115V, 1/2ASB 230V	33-010-007	Buss	MDL
SW1 & 2	Switch, Slide, SPST	34-062-001	H.H.Smith	515
J2	Receptacle, 3 Pin, 15A/725V	29-052-001	Tower	1061-1
R21,22 R23,24	FRAME SUBASSEMBLY Resistor, Variable, Dual 1K, 150mW Resistor, Variable, Dual 50K, 2W	40-412-001 40-414-001	** Allen-Bradley	-- JJ
T1	Power Transformer	27-346-001	**	--
DS1	Lamp, Neon	37-007-001	G.E.	AlH
SW2	Switch-Indicator, SPST	34-056-001	Marco-Oak	SW616-26

REFERENCE DESIGNATION	DESCRIPTION	W-L PART NO	MANUFACTURER	MFR. TYPE
R43,44	Resistor, Film, 15 Ω , 1W, 1%	40-002-007	IRC	CEC
R40	Resistor, Film, 56.2 Ω , 1W, 1%	40-002-021	IRC	CEC
R36	Resistor, Film, 68.1 Ω , 1W, 1%	40-002-023	IRC	CEC
R42,45	Resistor, Wirewound, 100 Ω , 10W, 5%	40-203-031	Hardwick-Hindle	3/4 BRS-56
R35	Resistor, Film, 121 Ω , 1W, 1%	40-002-029	IRC	CEC
R8	Resistor, Film, 150 Ω , 1W, 1%	40-002-031	IRC	CEC
R39,46	Resistor, Film, 182 Ω , 1W, 1%	40-002-033	IRC	CEC
R26,27	Resistor, Film, 475 Ω , 1W, 1%	40-002-043	IRC	CEC
R21,22,28,32	Resistor, Film, 1K, 1W, 1%	40-002-053	IRC	CEC
R10,14,37	Resistor, Film, 1.82K, 1W, 1%	40-002-059	IRC	CEC
R12,17,47,48	Resistor, Film, 2.21K, 1W, 1%	40-002-063	IRC	CEC
R15,19	Resistor, Film, 2.74K, 1W, 1%	40-002-065	IRC	CEC
R38	Resistor, Film, 3.32K, 1W, 1%	40-002-067	IRC	CEC
R18	Resistor, Film, 4.75K, 1W, 1%	40-002-071	IRC	CEC
R11,13,30	Resistor, Film, 5.62K, 1W, 1%	40-002-073	IRC	CEC
R25	Resistor, Film, 6.81K, 1W, 1%	40-002-075	IRC	CEC
R23,24,49,51	Resistor, Film, 10K, 1W, 1%	40-002-079	IRC	CEC
R29	Resistor, Film, 12.1K, 1W, 1%	40-002-081	IRC	CEC
R20	Resistor, Film, 15K, 1W, 1%	40-002-083	IRC	CEC
R9,16	Resistor, Film, 27.4K, 1W, 1%	40-002-089	IRC	CEC
R50	Resistor, Variable, 5K	40-418-009	Helipot	77P
R41	Resistor, Power, 1K, 15W, 5%	40-221-001	Hardwick-Hindle	BRS
R3	Resistor, W-W, 4.4K, .33W, 0.1%, 7ppm/ $^{\circ}$ C	40-187-001	Daven	1301
R55,56	Resistor, Film, 47 Ω , 1/4W, 10%	40-012-012	Allen-Bradley	CB
C2,4,5,7,10,14,18,19	Capacitor, Ceramic, .03 μ f, 50V, +80% -20%	45-902-002	Centralab	CK-303
C15	Capacitor, Mica, 180pf, 300V, 3%	45-003-013	Electro-Motive	DM 15F
C3	Capacitor, Mica, 470pf, 300V, 3%	45-003-023	Electro-Motive	DM 15F
C1	Capacitor, Mica, 1000pf, 300V, 3%	45-004-001	Electro-Motive	DM 19F
C13	Capacitor, Mica, 2200pf, 300V, 3%	45-004-009	Electro-Motive	DM 19F
C8	Capacitor, Mica, 3300pf, 300V, 3%	45-004-013	Electro-Motive	DM 19F

REFERENCE DESIGNATION	DESCRIPTION	W-L PART NO	MANUFACTURER	MFR. TYPE
C6 C17 C16,20	Capacitor, Mica, .018 μ f, 100V, 2% Capacitor, Mylar, 0.1 μ f, 200V, 10% Capacitor, Tantalum, 4.7 μ f, 50V, 20%	45-008-002 45-108-501 45-412-001	Electro-Motive Sprague Sprague	DM 20E 192P 150D
CR1,6-9 CR10	Diode, Silicon, 200mA, 120PIV Diode, Silicon Reference, 24V, 400mW	35-001-001 35-051-025	Fairchild Motorola	1N658 MZ-500-25
Q11 Q5,7 Q6,8,10,12,15 Q1-4 Q9 Q13 Q14	Transistor, PNP Silicon Transistor, PNP Silicon Transistor, NPN Silicon Transistor, NPN Silicon Transistor, PNP Silicon Transistor, PNP Silicon Transistor, NPN Silicon	30-033-001 30-038-001 30-039-001 30-040-001 30-045-001 30-054-001 30-011-021	** ** Sprague Sprague Fairchild ** **	-- 2N3906 TN53 2N4383 2N3645 -- --

REFERENCE DESIGNATION	DESCRIPTION	W-L PART NO	MANUFACTURER	MFR. TYPE
R43,44	Resistor, Film, 15 Ω , 1W, 1%	40-002-007	IRC	CEC
R40	Resistor, Film, 56.2 Ω , 1W, 1%	40-002-021	IRC	CEC
R36	Resistor, Film, 68.1 Ω , 1W, 1%	40-002-023	IRC	CEC
R34	Resistor, Film, 100 Ω , 1W, 1%	40-002-027	IRC	CEC
R35	Resistor, Film, 121 Ω , 1W, 1%	40-002-029	IRC	CEC
R4,8	Resistor, Film, 150 Ω , 1W, 1%	40-002-031	IRC	CEC
R39,46	Resistor, Film, 182 Ω , 1W, 1%	40-002-033	IRC	CEC
R26,27	Resistor, Film, 475 Ω , 1W, 1%	40-002-043	IRC	CEC
R21,22,28,32	Resistor, Film, 1K, 1W, 1%	40-002-053	IRC	CEC
R10,14,37	Resistor, Film, 1.82K, 1W, 1%	40-002-059	IRC	CEC
R5-7,12,17	Resistor, Film, 2.21K, 1W, 1%	40-002-063	IRC	CEC
R15,19	Resistor, Film, 2.74K, 1W, 1%	40-002-065	IRC	CEC
R38	Resistor, Film, 3.32K, 1W, 1%	40-002-067	IRC	CEC
R18	Resistor, Film, 4.75K, 1W, 1%	40-002-071	IRC	CEC
R11,13,30	Resistor, Film, 5.62K, 1W, 1%	40-002-073	IRC	CEC
R25	Resistor, Film, 6.81K, 1W, 1%	40-002-075	IRC	CEC
R23,24	Resistor, Film, 10K, 1W, 1%	40-002-079	IRC	CEC
R29	Resistor, Film, 12.1K, 1W, 1%	40-002-081	IRC	CEC
R20	Resistor, Film, 15K, 1W, 1%	40-002-083	IRC	CEC
R9,16	Resistor, Film, 27.3K, 1W, 1%	40-002-089	IRC	CEC
R33	Resistor, Film, 82.5K, 1W, 1%	40-002-101	IRC	CEC
R41	Resistor, Power, 1K, 15W, 5%	40-221-001	Hardwick-Hindle	BRS
R3	Resistor, W-W, 4.4K, .33W, 0.1%, 7ppm/ $^{\circ}$ C	40-187-001	Daven	1301
R42,45	Resistor, Power, 100 Ω , 10W, 5%	40-203-031	Hardwick-Hindle	BRS
R47,48	Resistor, Film, 47 Ω , 1/4W, 1%	40-012-012	Allen-Bradley	CB
C2,4,5,7,10,14,18,19	Capacitor, Ceramic, .03 μ f, 50V, +80% -20%	45-902-002	Centralab	CK-303
C15	Capacitor, Mica, 180pf, 300V, 3%	45-003-013	Electro-Motive	DM 15F
C3	Capacitor, Mica, 470pf, 300V, 3%	45-003-023	Electro-Motive	DM 15F
C1	Capacitor, Mica, 1000pf, 300V, 3%	45-004-001	Electro-Motive	DM 19F

INTEGRATOR BOARD (A2) 04-117-504 CONTINUED

REFERENCE DESIGNATION	DESCRIPTION	W-L PART NO	MANUFACTURER	MFR. TYPE
C13	Capacitor, Mica, 2200pf, 300V, 3%	45-004-009	Electro-Motive	DM 19F
C8	Capacitor, Mica, 3300pf, 300V, 3%	45-004-013	Electro-Motive	DM 19F
C6	Capacitor, Mica, .018 μ f, 100V, 2%	45-008-002	Electro-Motive	DM 20E
C17	Capacitor, Mylar, 0.1 μ f, 200V, 10%	45-108-501	Sprague	192P
C16,20	Capacitor, Tantalum, 4.7 μ f, 50V, 20%	45-412-001	Sprague	150D
CR1,6-9	Diode, Silicon, 200mA, 120 PIV	35-001-001	Fairchild	1N658
CR2-5	Diode, Silicon, 75mA, 50 PIV	35-005-001	Fairchild	FD100
CR10	Diode, Silicon Reference, 24V, 400mW	35-051-025	Motorola	MZ500
Q11	Transistor, PNP Silicon	30-033-001	Motorola	2N1132
Q5,7,16-18	Transistor, PNP Silicon	30-038-001	Motorola	2N3906
Q6,8,10,12,15	Transistor, NPN Silicon	30-039-001	Sprague	TN53
Q1-4	Transistor, NPN Silicon	30-040-001	Sprague	2N4383
Q9	Transistor, PNP Silicon	30-045-001	Fairchild	2N3645
Q13	Transistor, PNP Silicon	30-054-001	Motorola	2N3634
Q14	Transistor, NPN Silicon	30-011-021	**	--

REFERENCE DESIGNATION	DESCRIPTION	W-L PART NO	MANUFACTURER	MFR. TYPE
R10, 11	Resistor, Film, 47.5 Ω , 1W, 1%	40-002-019	IRC	CEC
R14	Resistor, Film, 562 Ω , 1W, 1%	40-002-045	IRC	CEC
R17	Resistor, Film, 825 Ω , 1W, 1%	40-002-051	IRC	CEC
R13	Resistor, Film, 1.5K, 1W, 1%	40-002-057	IRC	CEC
R18	Resistor, Film, 2.21K, 1W, 1%	40-002-063	IRC	CEC
R4	Resistor, Film, 3.32K, 1W, 1%	40-002-067	IRC	CEC
R5, 6	Resistor, Film, 4.75K, 1W, 1%	40-002-071	IRC	CEC
R12	Resistor, Film, 8.25K, 1W, 1%	40-002-077	IRC	CEC
R3	Resistor, Film, 10K, 0.3W, 0.1% 5ppm/ $^{\circ}$ C	40-006-001	Vishay	S102
R2	Resistor, Film, 22.1K, 1W, 1%	40-002-087	IRC	CEC
R21	Resistor, Film, 182K, 1W, 1%	40-002-109	IRC	CEC
R23	Resistor, Film, 221K, 1W, 1%	40-002-111	IRC	CEC
R1	Resistor, Film, 392K, 1W, 1%	40-002-117	IRC	CEC
R22	Resistor, W-W, 7.5K, 1/4W, 1% 20ppm/ $^{\circ}$ C	40-191-001	Daven	1250
R8, 20	Resistor, W-W, 11K, 1/4W, 0.1% 7ppm/ $^{\circ}$ C	40-176-209	Daven	1250
R9	Resistor, Variable, 5K, .75W, 10T	40-409-009	Helipot	75PR
R19	Resistor, Film, 10K, 1W, 1% $\pm$ 100ppm/ $^{\circ}$ C	40-002-079	IRC	CEC
C7, 8, 9, 10	Capacitor, Aluminum, 50 μ f, 15V	45-215-053	Sprague	30D
C1, 2	Capacitor, Aluminum, 150 μ f, 15V	45-215-052	Sprague	30D
C3, 4, 14	Capacitor, Ceramic, .03 μ f, 50V, +80% -20%	45-902-002	Centralab	CK-303
C13	Capacitor, Mica, 5pf, 300V, $\pm$.5pf	45-001-004	Electro-Motive	DM 15C
C6	Capacitor, Mica, 47pf, 300V, 3%	45-002-005	Electro-Motive	DM 15E
C5	Capacitor, Mica, 470pf, 300V, 3%	45-003-023	Electro-Motive	DM 15F
C12	Capacitor, Variable, 2-8pf, NPO	45-504-002	Erie	538
CR4	Diode, Silicon Reference, 11.7V, 750mW 5%	35-056-001	Motorola	1N3581
AR1	Amplifier, Integrated Circuit	50-007-001	Fairchild	μ A709C

REFERENCE DESIGNATION	DESCRIPTION	W-L PART NO	MANUFACTURER	MFR. TYPE
R3-6 R1,2	Resistor, Power, 1 Ω , 3W, 5% Resistor, Power, 5 Ω , 10W, 5%	40-219-001 40-220-001	Ward-Leonard Ward-Leonard	3X 10XM
CR1-4	Diode, Silicon Rectifier, 3A, 200 PIV	35-053-001	Motorola	MR2071
Q2	Transistor, NPN Silicon	30-039-001	Sprague	TN53
Q6	Transistor, PNP Silicon	30-086-001	RCA	2N4314
Q4	Transistor, PNP Silicon	30-046-001	Motorola	MJ2253
Q5	Transistor, PNP Silicon	30-047-001	Motorola	MJ2268
Q1	Transistor, NPN Silicon	30-048-001	Motorola	MJ2256
Q3	Transistor, NPN Silicon	30-052-001	Motorola	MJ2249
R32	Resistor, Film, 47.5 Ω , 1W, 1%	40-002-019	IRC	CEC
SW1	Thermostat, Open 185°F: Close 135°F	41-005-002	Klixon - T.I.	20700L

REFERENCE DESIGNATION	DESCRIPTION	W-L PART NO	MANUFACTURER	MFR. TYPE
R3,6,7,9 R17 R25,28 R26,27 R29,30 R19 R14,15,24 R12,13,21 R20 R16 R4,5 R18 R22,23 R31	Resistor, Film, 562 Ω , 1W, 1% Resistor, Film, 1K, 1W, 1% Resistor, Film, 1.82K, 1W, 1% Resistor, Film, 2.21K, 1W, 1% Resistor, Film, 4.75K, 1W, 1% Resistor, Film, 6.81K, 1W, 1% Resistor, Film, 8.25K, 1W, 1% Resistor, Film, 10K, 1W, 1% Resistor, Film, 15K, 1W, 1% Resistor, Film, 33.2K, 1W, 1% Resistor, Film, 39.2K, 1W, 1% Resistor, Variable, 2K, 2W Resistor, W-W, 10K, 1/4W, 0.1% 7ppm/ $^{\circ}$ C Resistor, Film, 10 Ω , 1W, 1%	40-002-045 40-002-053 40-002-059 40-002-063 40-002-071 40-002-075 40-002-077 40-002-079 40-002-083 40-002-091 40-002-093 40-413-004 40-176-200 40-002-003	IRC IRC IRC IRC IRC IRC IRC IRC IRC IRC Clarostat Daven IRC	CEC CEC CEC CEC CEC CEC CEC CEC CEC CEC 39 1250 CEC
C5,6 C4 C3,7 C8	Capacitor, Aluminum, 20 μ f, 50V Capacitor, Mica, 33pf, 300V, 3% Capacitor, Mylar, .1 μ f, 100V, 10% Capacitor, Mylar, .01 μ f, 100V, 10%	45-214-004 45-002-003 45-102-004 45-101-003	Sprague Electro-Motive Electro-Motive Electro-Motive	30D DM 15E DM 15F P710311
CR5-16 CR18 CR17	Diode, Silicon, 200mA, 120 PIV Diode, Silicon Reference, 6.8V, 400mW Diode, Silicon Reference, 9.1V, 400mW	35-001-001 35-051-012 35-051-015	Fairchild Motorola Motorola	1N658 MZ500 MZ500
Q3,10,11 Q4,8,9,15 Q5	Transistor, PNP Silicon Transistor, NPN Silicon Transistor, PNP Silicon	30-038-001 30-039-001 30-086-001	Motorola Sprague RCA	2N3906 TN53 2N4314

REFERENCE DESIGNATION	DESCRIPTION	W-L PART NO	MANUFACTURER	MFR. TYPE
R36, 37	Resistor, Film, 47 Ω , 1/4W, 10%	40-012-012	Allen-Bradley	CB
R29, 30	Resistor, Film, 15 Ω , 1W, 1%	40-002-007	IRC	CEC
R26	Resistor, Film, 56.2 Ω , 1W, 1%	40-002-021	IRC	CEC
R22	Resistor, Film, 68.1 Ω , 1W, 1%	40-002-023	IRC	CEC
R20, 28	Resistor, Film, 100 Ω , 1W, 1%	40-002-027	IRC	CEC
R5	Resistor, Film, 150 Ω , 1W, 1%	40-002-031	IRC	CEC
R25, 34	Resistor, Film, 182 Ω , 1W, 1%	40-002-033	IRC	CEC
R16, 18	Resistor, Film, 1K, 1W, 1%	40-002-053	IRC	CEC
R7, 11, 15, 23	Resistor, Film, 1.82K, 1W, 1%	40-002-059	IRC	CEC
R9, 14	Resistor, Film, 2.21K, 1W, 1%	40-002-063	IRC	CEC
R12	Resistor, Film, 2.74K, 1W, 1%	40-002-065	IRC	CEC
R4, 24	Resistor, Film, 3.32K, 1W, 1%	40-002-067	IRC	CEC
R8, 10	Resistor, Film, 5.62K, 1W, 1%	40-002-073	IRC	CEC
R32	Resistor, Film, 8.25K, 1W, 1%	40-002-077	IRC	CEC
R2	Resistor, Film, 10K, 1W, 1%	40-002-079	IRC	CEC
R17	Resistor, Film, 12.1K, 1W, 1%	40-002-081	IRC	CEC
R6, 13	Resistor, Film, 27.4K, 1W, 1%	40-002-089	IRC	CEC
R35	Resistor, Film, 221K, 1W, 1%	40-002-111	IRC	CEC
R27	Resistor, Power, 1K, 15W, 5%	40-221-001	Hardwick-Hindle	BRS
R3, 33	Resistor, W-W, 10K, .33W, 0.1%, 7ppm/ $^{\circ}$ C	40-187-002	Daven	1301
C2, 4, 5, 9, 11	Capacitor, Ceramic, .03 μ f, 50V, +80% -20%	45-902-002	Centralab	CK-303
C13	Capacitor, Mica, 2pf, 300V, $\pm$.5pf	45-001-003	Electro-Motive	DM 15C
C10	Capacitor, Mica, 180pf, 300V, 3%	45-003-013	Electro-Motive	DM 15F
C3	Capacitor, Mica, 470pf, 300V, 3%	45-003-023	Electro-Motive	DM 15F
C1	Capacitor, Mica, 1000pf, 300V, 3%	45-004-001	Electro-Motive	DM 19F
C8	Capacitor, Mica, 2200pf, 300V, 3%	45-004-009	Electro-Motive	DM 19F
C12	Capacitor, Mylar, 0.1 μ f, 200V, 10%	45-108-501	Sprague	192P

REFERENCE DESIGNATION	DESCRIPTION	W-L PART NO	MANUFACTURER	MFR. TYPE
CR1-3 CR4	Diode, Silicon, 200mA, 120 PIV Diode, Silicon Reference, 24V, 400mW	35-001-001 35-051-025	Fairchild Motorola	1N658 MZ500
Q7 Q5 Q6,8,11 Q1-4 Q9 Q10	Transistor, PNP Silicon Transistor, PNP Silicon Transistor, NPN Silicon Transistor, NPN Silicon Transistor, PNP Silicon Transistor, NPN Silicon	30-033-001 30-038-001 30-039-001 30-040-001 30-054-001 30-011-021	** ** Sprague Sprague Motorola **	-- 2N3906 TN53 2N4383 2N3634 --

REFERENCE DESIGNATION	DESCRIPTION	W-L PART NO	MANUFACTURER	MFR. TYPE
R1,2,3,4	Resistor, Film, 47.5K, 1W, 1%	40-002-095	IRC	CEC
C2	Capacitor, Aluminum, 10 μ f, 15V	45-215-051	Sprague	30D
C1	Capacitor, Aluminum, 100 μ f, 25V	45-215-003	Sprague	30D
C4	Capacitor, Mylar, .15 μ f, 200V, 10%	45-110-501	Sprague	192P
C3	Capacitor, Mylar, 0.82 μ f, 100V, 20%	45-129-003	Elpac	ZD
SW1-B	Switch, Rotary, 2 Pole, 5 Pos.	34-063-002	CTS	212

REFERENCE DESIGNATION	DESCRIPTION	W-L PART NO	MANUFACTURER	MFR. TYPE
R3,6 R8 R7 R1,4 R2,5 R10	Resistor, Composition, 6.8M, 1/2W, 5% Resistor, Film, 18.2Ω, 1W, 1% Resistor, Film, 33.2Ω, 1W, 1% Resistor, Film, 68K, 1W, 1% Resistor, Film, 680K, 1W, 1% Resistor, Variable, 500Ω, 2W	40-009-025 40-002-009 40-002-015 40-002-099 40-002-123 40-413-003	Allen-Bradley IRC IRC IRC IRC ClaroStat	CB CEC CEC CEC CEC 39
C2-4,7-9,11-13 C14 C16 C10 C6 C5 C1 C15	Capacitor, Mica, Trim, 300V, 3% Capacitor, Mica, 330pf, 300V, 2% Capacitor, Mica, 1800pf, 300V, 3% Capacitor, Mica, 3300pf, 300V, 2% Capacitor, Mica, .015μf, 100V, 2% Capacitor, Mica, .018μf, 100V, 2% Capacitor, Polystyrene, .33μf, 100V, 2% Capacitor, Variable, .8-30pf, 1kV	* 45-003-219 45-004-007 45-004-213 45-008-003 45-008-002 45-315-006 45-510-001	Electro-Motive Electro-Motive Electro-Motive Electro-Motive Electro-Motive Elpac Erie	-- DM 15F DM 19F DM 19F DM 20E DM 20E PDR 569-013
SW1-C	Switch Rotary, 2 Pole, 5 Pos.	34-063-002	CTS	212

REFERENCE DESIGNATION	DESCRIPTION	W-L PART NO.	MANUFACTURER	MFR. TYPE
R3	Resistor, Composition, 6.8M, 1/2W, 5%	40-009-025	Allen-Bradley	EB
R1	Resistor, Film, 68K, 1W, 1%	40-002-099	IRC	CEC
R2	Resistor, Film, 680K, 1W, 1%	40-002-123	IRC	CEC
R4	Resistor, Composition, 15M Ω , 1/2W, 5%	40-009-028	Allen-Bradley	EB
C14	Capacitor, Mica, 330pf, 300V, 2%	45-003-219	Electro-Motive	DM 15F
C10	Capacitor, Mica, 3300pf, 300V, 2%	45-004-213	Electro-Motive	DM 19F
C6	Capacitor, Mica, .015 μ f, 100V, 2%	45-008-003	Electro-Motive	DM 20E
C5	Capacitor, Mica, .018 μ f, 100V, 2%	45-008-002	Electro-Motive	DM 20E
C2,3,4,7,8,9,11,12,13	Capacitor, Mica, Trim, 300V, 3%	*	Electro-Motive	--
C1	Capacitor, Polystyrene, .33 μ f, 100V, 2%	45-315-006	Elpac	PDR
C15	Capacitor, Variable, .8-30pf, 2kv	45-510-001	Erie	569-013
SW1-D	Switch, Rotary, 2 Pole, 5 Pos.	34-063-002	CTS	212

REFERENCE DESIGNATION	DESCRIPTION	W-L PART NO	MANUFACTURER	MFR. TYPE
R4	Resistor, Film, 18.2K, 1W, 1%	40-002-085	IRC	CEC
R2	Resistor, Film, 15K, 1W, 1%	40-002-083	IRC	CEC
R6	Resistor, Film, 8.25K, 1W, 1%	40-002-077	IRC	CEC
R8	Resistor, Film, 5.62K, 1W, 1%	40-002-073	IRC	CEC
R1, 3, 5, 7	Resistor, Film, 100K, 1W, 1%	40-002-103	IRC	CEC
C8	Capacitor, Mica, 4700pf, 300V, 3%	45-005-001	Electro-Motive	DM 20F
C6, 7	Capacitor, Mylar, .047 μ f, 100V, 20%	45-129-001	Elpac	ZD
C4, 5	Capacitor, Mylar, .47 μ f, 100V, 20%	45-129-002	Elpac	ZD
C2	Capacitor, Mylar, 4 μ f, 100V, 20%	45-122-101	Good-All	X663F
C3	Capacitor, Mylar, 5 μ f, 100V, 20%	45-122-102	Good-All	X663F
C1A, B, C, D	Capacitor, Mylar, 10 μ f, 100V, 20%	45-122-103	Good-All	X663F
SW1-E	Switch, Rotary, 2 Pole, 5 Pos.	34-063-002	CTS	212

REFERENCE DESIGNATION	DESCRIPTION	W-L PART NO	MANUFACTURER	MFR. TYPE
R25	Resistor, Film, 100K, 1W, 1%	40-002-103	IRC	CEC
R3,7	Resistor, Variable, 50 Ω , 2W	40-413-001	ClaroStat	39
R2,11	Resistor, Variable, 500 Ω , 2W	40-413-003	ClaroStat	39
R4,8	Resistor, W-W, 82 Ω , 1/4W, 0.1%, 7ppm/ $^{\circ}$ C	40-176-007	Daven	1250
R1	Resistor, Film, 82K, 1W, 1%	40-002-101	IRC	CEC
R26,27	Resistor, Film, 10K, 1W, 1%	40-002-079	IRC	CEC
J1	Connector, Male 29 Pin	29-032-129	Elco	7023
J6	Connector, Female			
C7,8	Capacitor, Aluminum, 1300 μ f, 100V	45-221-451	Mallory	CG
C1,2,3,4,5,6	Capacitor, Aluminum, 2600 μ f, 50V	45-218-352	Sprague	36D

ACCESSORY LIST

REFERENCE DESIGNATION	DESCRIPTION	W-L PART NO	MANUFACTURER	MFR. TYPE
	Rack Mounting Ears	03-117-280	Weston- Lexington	--
	Adapter, Impedance, 200Ω x 10 Atten. 50Ω	02-117-307	Weston- Lexington	--
	Adapter, Impedance, 200Ω x 1 Atten. 600Ω	02-117-308	Weston- Lexington	--
	Extender Board	13-117-063	Weston- Lexington	--

REFERENCE DESIGNATION	DESCRIPTION	W-L PART NO	MANUFACTURER	MFR. TYPE
External Sync.	Assy., A4 Option 05 Board Mach., A4 Option 05 Board	14-117-087 13-117-086	Weston-Lex. Weston-Lex.	Reference Reference
C1,2	Capacitor, Tantalum, 47 μ f, 20V, 20%	45-407-001	Sprague	150D
CR1,2	Diode, Silicon Reference, 10V, 400mW	35-051-016	Motorola	MZ500
R1,5	Resistor, Film, 6.81K, 1W, 1%	40-002-075	IRC	CEC
R2	Resistor, Film, 1.82K, 1W, 1%	40-002-059	IRC	CEC
R3	Resistor, Film, 8.25K, 1W, 1%	40-002-077	IRC	CEC
R4	Resistor, Film, 825 Ω , 1W, 1%	40-002-051	IRC	CEC
F2	REAR PANEL Cover Plate Type II Fuseholder Fuse 1/32 Amp	03-117-103 33-001-001 33-011-006	Weston-Lex. Little Fuse Buss	Reference 34 2012 AGC
S4	Switch, Slide	34-	Stackpole	

OPTION 07. GUARD DRIVER

REFERENCE DESIGNATION	DESCRIPTION	W-L PART NO	MANUFACTURER	MFR. TYPE
J3 P3	Connector Connector		Switch Craft Switch Craft	2504FP 2504M
TB1 C	Guard Driver Amp Mach., Guard Driver Amp	14-117-234 13-117-233	Weston-Lex. Weston-Lex.	Reference Reference
C1,2,3,4	Capacitor, Ceramic, .03 μ f, 50V, +80% -20%	45-902-002	Cramer	CK-303
C5	Capacitor, Mylar, .01 μ f, 100V, 10%	45-102-004	Electro-Motive	P710411
CRL1,2	Diode, Silicon, Sw	35-005-001	Texas Inst.	1N916
R1,5,15 R2,6,10 R3 R4 R7,8 R9 R11,16 R12,13 R14	Resistor, Film, 10K, 1W, 1% Resistor, Film, 4.75K, 1W, 1% Resistor, Film, 274K, 1W, 1% Resistor, Film, 1K, 1W, 1% Resistor, Film, 56.7 Ω , 1W, 1% Resistor, Film, 2.21K, 1W, 1% Resistor, Film, 47.5 Ω , 1W, 1% Resistor, Film, 15 Ω , 1W, 1% Resistor, Film, 10 Ω , 1W, 1%	40-002-079 40-002-071 40-002-113 40-002-087 40-002-021 40-002-063 40-002-019 40-002-007 40-002-003	IRC IRC IRC IRC IRC IRC IRC IRC IRC	CEC CEC CEC CEC CEC CEC CEC CEC CEC
Q1,3	Transistor, Diffused Silicon,	30-045-001	Fairchild Motorola	2N3645
Q2 Q4 Q5	Transistor, Silicon Transistor, PNP Silicon - High Power Transistor, NPN Silicon	30-083-001 30-054-001 30-082-001	Fairchild Motorola Fairchild Motorola Motorola	2N3568 2N3634 MJE340

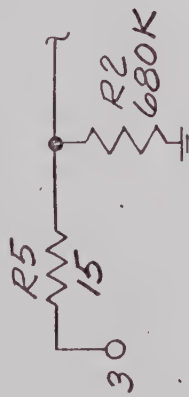
OPTION 08., FLATNESS

REFERENCE DESIGNATION	DESCRIPTION	W-L PART NO	MANUFACTURER	MFR. TYPE
R28, 29, 30, 31	Resistor, Trim	*	--	--
SW1-B				
R5	Resistor, Film, 1.2M, 1W, 1%	40-002-129	IRC	CEC
R6	Resistor, Film, 100K, 1W, 1%	40-002-103	IRC	CEC

MANUAL CHANGES, MODEL 100

PAGE NO.	CHANGE	FROM	TO	SERIAL NO.
	R23	Resistor, Film, 221K, 1W, 1%; 40-002-111; IRC; CEC - To - Resistor, W-W, 13.83K, 1/4W, 0.1% 5PPM/°C; 40-103-069; Daven; 1274		136
7-7	R8	11K, 7PPM/°C, 40-176-209; 1250 - To - 13.83K; 5PPM/°C, 40-103-069; 1274		136
	R17	825 ohm; 40-002-051	681 ohm; 40-002-049	
04-117-505 (1-2)	R8	13.73K	13.83K	136
7-6	-	CR2, 3, 4, 5	CR2, 5	104
04-117-504	-	Delete CR3 & CR4		104
7-8	R32	47.5 ohm, 1W, 1%; 40-002-019; IRC; CEC - To 47 ohm, 1/4W, 10%; 40-012-012, Allen-Bradley; CB		104
7-10	-	Add - R40; Resistor; Composition, 3.9K, 1/4W, 5%; 40-003-024; Allen-Bradley; CB		129
	C13	2 pf; 45-001-003	10 pf; 45-001-005	
04-117-507	-	Add R40 (3.9K) As Shown Below	<pre> graph LR C13[C13 10pf] --- Node1 R40[R40 3.9K] --- Node1 Node1 --- R33[R33 10K] </pre>	129

MANUAL CHANGES, MODEL 100

PAGE NO.	CHANGE	FROM	TO	SERIAL NO.
7-14	-	Add - R5; Resistor, Film, 15 ohm, 1W, 1%; 40-001-007, IRC; CEC		129
7-15	R4	18.2K; 40-002-085	10K; 40-002-079	129
	R2	15K; 40-002-083	6.8K; 40-002-075	
	R8	5.62K; 40-002-073	8.2K; 40-002-077	
04-117-508	-	Ref SW1-D Board, Add R5 (15) As Shown Below 		129
1-8	Option 01	$\pm 0.05\%/^{\circ}\text{C}$	$\pm 0.005\%/^{\circ}\text{C}$	ALL
7-7	R22	W-W, 7.5K, 1/4W, 20PPM/°C; 40-191-001; Daven; 1250 - To - Film, 47.5K, 1W; 40-002-095; IRC; CEC		ALL
7-19		Delete R1 and C1		129
7-14		Change C10, C6, C5, and C1 to trim		129
7-12		Add R5 Resistor, Film, 1M, 1W, 1%; 40-002-127; IRC; CEC (Sch. Correct) Add R6 Resistor, Film, 100K, 1W, 1%; 40-002-103; IRC; CEC (Sch. Correct)		229

MANUAL CHANGES, MODEL 100

PAGE NO.	CHANGE	FROM	TO	SERIAL NO.
7-13		CHG. C10, C6, C5, C1 to trim		129
7-10	Add R38	R20, 28	R20, 28, 38 (Added) (Schematic Correct)	229
7-10	Add C14	C2, 4, 5, 9, 11	C2, 4, 5, 9, 11, 14 (Added) (Schematic Correct)	229
3-3	3.4.5. (Cont.)	Last Sentence - Reads: Maximum modulating signal for 100% modulation will never exceed 5 volts peak-to-peak. Should read: Maximum modulating signal should never exceed 5 volts peak-to-peak.		All
5-5	5.4.	Frequency response adjust - First two sentences rewritten as follows: Capacitors C12 and C13 on the A4 board are trim capacitors to adjust the high frequency response of the oscillator. On some units, these capacitors are not necessary. If C12 and C13 are present, it is not anticipated that these capacitors would normally require readjustment during the life of the equipment.		—
7-7	-	Change C12 and C13 to trim		See above Change
7-17	-	Add 2 Jonathan Mfg. Co. Slides No. 130, 18" long		All
04-117-503 & 504	-	Add note No. 2. <u>CAUTION</u> Heat Sink on Q13 and Q14 absolutely essential to prevent over dissipation on transistors.		All

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